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John Prohaska

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EXAMINER

WANG, QUAN ZHEN

ART UNIT

PAPER NUMBER

2633

DATE MAILED: 10/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/976,290

Applicant(s)

PROHASKA, JOHN

Examiner

Quan-Zhen Wang

Art Unit

2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1-22/02 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The Final Office Action mailed on 19 May 2005 has been withdrawn in view of newly discovered references. The indicated allowability of claims 2, and 15-16 is withdrawn in view of the newly discovered reference(s) to Gloeckner et al. (U.S. Patent US 6,445,841 B1) and Solgaard et al. (U.S. Patent US 6,097,859). Rejections based on the newly cited reference(s) follow.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "a cross-connect switch which includes a plurality of input port fibers"; "a MEMS cross-connect switch, comprising a plurality of input port fibers"; and "a pair of orthogonal single-axis mirror actuators" must be shown or the feature(s) canceled from the claim(s). (The single-axis mirror actuators shown in fig. 7 are all in parallel). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for

Art Unit: 2633

consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 8 and 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 8 and 15 recite the limitation "a pair of orthogonal single axis mirror actuators". However, the specification does not describe the recited limitation in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2 and 15-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "the re-configurable wavelength drop" in line 10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, and 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA).

Regarding claim 1, Henry teaches a re-configurable wavelength selective device (fig. 6) comprising an input fiber (fig. 6, IN), where a signal comprising multiple wavelengths is brought into the device, a cross-connect switch (fig. 6, 1XN switch 60), two output fibers, one for a selected wavelength λ_i (fig. 6, DROP) and the other for the remaining wavelengths which pass through the device unaffected (fig. 6, OUT). The system of Henry differs from the claimed invention in that Henry does not specifically teach that the cross-connect switch includes a plurality of input fibers and an array of micro-mirror actuators. However, it is well known in the art that an array of micro

Art Unit: 2633

mirrors can be used for a cross-connect. For example, APA pointed out that "MEMS actuated micro-mirrors offer an inexpensive, versatile way to redirect light beams in optical systems" (page 3, lines 8-9). APA further pointed out that "micro-mirrors may be readily formed into small to large arrays using a wide array micromachining techniques" (page 3, lines 13-14). APA further pointed out that "MEMS devices have been used ... as wavelength selective switches" (page 3, lines 18-19). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a micro-mirror based cross-connect switch including a plurality of input ports, as it is disclosed by APA, into the system of Henry in order to redirect light beams in an inexpensive, versatile way.

Regarding claims 3-4, Henry further teaches that the system further comprising an optical circulator (fig. 6, circulator 50), and the selected wavelength is output from the optical circulator (fig. 6, DROP).

Regarding claim 5, Henry further teaches that the cross-connect switch further comprises a plurality of output fibers that each includes a fiber Bragg grating (fig. 6, A1 – An).

Regarding claim 6, Henry further teaches that the cross-connect switch comprises an array of output fibers (fig. 6, A1-An). It is inherent that for a micro-mirror based cross-connect switch, a signal received at any of the input port fibers may be output via any one of the outputs.

Art Unit: 2633

9. Claims 9-14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al. (U.S. Patent US 6,768,822 B1) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA).

Regarding claim 9, Robinson teaches a reconfigurable dispersion compensation device (fig. 1), comprising: an input fiber (fig. 1, input fiber 7) including a corrupted signal (fig. 1, light in); and a cross-connected switch that receives the corrupted signal and directs the corrupted signal to one of a plurality dispersion compensation gratings (fig. 1, Q1-Q5) for imparting a compensating dispersion to the corrupted signal (column 3, lines 41-67), and an output (fig. 1, output 8) for providing a compensated signal (fig. 1, light out). The system of Robinson differs from the claimed invention in that Robinson does not specifically teach that the connect switch further comprising an array of micro-mirror actuators. However, it is well known in the art that an array of micro mirrors can be used for a cross-connect. For example, APA pointed out that "MEMS actuated micro-mirrors offer an inexpensive, versatile way to redirect light beams in optical systems" (page 3, lines 8-9). APA further pointed out that "micro-mirrors may be readily formed into small to large arrays using a wide array micromachining techniques" (page 3, lines 13-14). APA further pointed out that "MEMS devices have been used ... as wavelength selective switches" (page 3, lines 18-19). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a micro-mirror based cross-connect switch, as it is disclosed by APA, into the system of Robinson in order to redirect light beams in an inexpensive, versatile way.

Regarding claims 10 and 14, Robinson further teaches that the system further comprising a circulator (fig. 1, circulator 2) for receiving the corrupted signal and for output the compensated signal, and the compensated signal is passed through the circulator and to the output fiber (fig. 1, output fiber 8).

Regarding claim 11-12, Robinson further teaches that the dispersion compensation gratings are fiber Bragg gratings with unique period variations (column3, lines 41-67).

Regarding claim 13, APA further discloses that the micro-mirror actuator further comprises a pair of orthogonal single axis mirror actuator (page 3, lines 8-27).

10. Claims 2 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of Gloeckner et al. (U.S. Patent US 6,445,841 B1) and further in view of Fritz et al. (U.S. Patent US 5,446,809).

Regarding claim 2, as it is understood in view of the above 112 problem, Henry teaches a reconfigurable wavelength selective device comprising an optical circulator (fig. 6, circulators 50), having a first port, a second port and a third port, wherein, inherently, light entering the first port exits the second port, light entering the second port exits the third port, and light entering the third port exists the first port; a plurality of fiber Bragg gratings (FBGs) configured to provide narrow band spectral filtering by retro-reflecting the Bragg wavelength (fig. 6, Bragg gratings A1-An). Henry differs from the claimed invention in that Henry does not specifically teach to use a MEMS cross-connect switch, comprising a plurality of input port fibers, at least one array of micro-

Art Unit: 2633

minor actuators, and an array of output fibers, said cross- connect switch configured so that an optical signal received from any one of the input fibers may be directed to any one of the output fibers via the micro-mirror array. However, it is well known in the art to use a MEMS cross-connect switch. For example, Gloeckner discloses a MEMS cross-connect switch (fig. 9), comprising a plurality of input port fibers (fig. 9, input fibers), at least one array of micro-minor actuators (fig. 9, MEMS micro-mirrors), and an array of output fibers (fig. 9, output fibers), said cross- connect switch configured so that an optical signal received from any one of the input fibers may be directed to any one of the output fibers via the micro-mirror array (column 10, lines 35-61). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a MEMS cross-connect switch, as one taught by Gloeckner, into the system of Henry to replace the 1xN switch of 60 in order to increase the flexibility of wavelength selective device. The modified system of Henry and Gloeckner further differs from the claimed invention in that Henry and Gloeckner do not specifically teach to use a fiber optic coupler configured to combine all of the cross-connect switch output branches so that unselected wavelength channels exit the re-configurable wavelength drop through a single fiber port. However, the unselected wavelength channels do exit the re-configurable wavelength drop through a single fiber port in modified system of Henry and Gloeckner (Henry; fig. 6, output port of circulator 51). In addition, a fiber optic coupler is well known in the art. For example, Fritz discloses a Nx1 coupler (fig. 7) to couple N optical fibers into a single optical fiber. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to

incorporate a Nx1 fiber optical coupler, as it is taught by Fritz, into the modified system of Henry and Gloeckner, and configure the coupler to combine all of the cross-connect switch output branches so that unselected wavelength channels exit the re-configurable wavelength drop through a single fiber port in order to simplify the modified wavelength selective device.

Regarding claim 16, the Fiber Bragg Gratings of Henry includes unique period variations.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Fritz et al. (U.S. Patent US 5,446,809).

Regarding claim 7, the modified system of Henry and APA differs from the claimed invention in that Henry and APA do not specifically teach that the system further comprising a fiber optical coupler configured to combine branches outputted from the cross-connect switch so that unselected wavelength channels exit through the other of the two output fibers. However, it is well known in the art to use a fiber optic coupler to combine a plurality of optical fibers to one output fiber. For example, Fritz teaches an optical coupler (fig. 5) to combine 16 fibers into one output fiber. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a fiber optic coupler, such as the one taught by Fritz, into the modified system of Henry and APA in order to combine the plurality of outputs of the cross-connect switch into one output fiber.

Art Unit: 2633

12. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Solgaard et al. (U.S. Patent US 6,097,859).

Regarding claim 8, as it is understood in view of the above 112 problem, the APA figs 4A and 4B further teaches single axis mirror actuators. The modified system of Henry and APA differs from the claimed invention in that Henry and APA do not specifically teach that the micro-mirror actuators further comprise a pair of orthogonal mirror actuators. However, it is well known in the art to use a pair of orthogonal micro-mirror actuators for a cross-connect switch. For example, Solgaard teaches to use a pair of orthogonal micro-mirror actuators (fig. 2, micro-mirrors 46a and 46e) for a cross-connect switch. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a pair of orthogonal micro-mirror actuators, as it is disclosed by Solgaard, into the modified system of Henry and APA in order to selectively switch the input optical signal to desired output port.

13. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of Gloeckner et al. (U.S. Patent US 6,445,841 B1), Fritz et al. (U.S. Patent US 5,446,809), and admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Solgaard et al. (U.S. Patent US 6,097,859).

Regarding claim 15, as it is understood in view of the above 112 problem, the modified system of Henry, Gloeckner, and Fritz differs from the claimed invention in that

Art Unit: 2633

Henry, Gloeckner, and Fritz do not specifically teach that the micro-mirror actuators are single axis micro-mirrors. However, single axis micro-mirrors are well known in the art, as it is admitted by the applicants in the prior art figs. 4A and 4B. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate the prior art single axis micro-mirrors into the modified system of Henry, Gloeckner, and Fritz in order to "offer an inexpensive, versatile way to redirect light beams in optical systems". The modified system of Henry, Gloeckner, Fritz, and APA further differs from the claimed invention in that Henry, Gloeckner, Fritz, and APA do not specifically teach that the micro-mirror actuators further comprise a pair of orthogonal mirror actuators. However, it is well known in the art to use a pair of orthogonal micro-mirror actuators for a cross-connect switch. For example, Solgaard teaches to use a pair of orthogonal micro-mirror actuators (fig. 2, micro-mirrors 46a and 46e) for a cross-connect switch. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a pair of orthogonal micro-mirror actuators, as it is disclosed by Solgaard, into the modified system of Henry and APA in order to selectively switch the input optical signal to desired output port.

Response to Amendment

14. Applicant's arguments with respect to claims 1, 3-14 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 2633

Conclusion


15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Riza (U.S. Patent US 6,525,863 B1) discloses a multi-technology multi-beam-former platform for robust fiber-optic beam control modules.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quan-Zhen Wang whose telephone number is (571) 272-3114. The examiner can normally be reached on 9:00 AM - 5:00 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

qzw
8/18/05


M. R. SEDIGHIAN
PRIMARY EXAMINER